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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,253	01/13/2004	Denise M. Eppich	MI22-2467	4387
21567	7590	06/29/2004	EXAMINER	
WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201			LEE, HSIEN MING	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 06/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/757,253	<b>Applicant(s)</b> EPPICH ET AL.	
	<b>Examiner</b> Hsien-Ming Lee	<b>Art Unit</b> 2823	

-- **Th MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 31-57 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 31-39 is/are allowed.
- 6) ☒ Claim(s) 40-43, 46-52, 54, 56 and 57 is/are rejected.
- 7) ☒ Claim(s) 44, 45, 53 and 55 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

*Hsien Ming Lee* 6/5/2004

## DETAILED ACTION

### Remarks

1. Applicant's cancellation to claims 1-30 and 58-94 is acknowledged. Thus, claims 31-57 are pending in the application.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 40-42, 46-51, 56 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uhlenbrock et al. (US 6,319,832) in view of Chun et al. (US 6,277,702).

In re claims 40, 41, 46-50, 56 and 57, Uhlenbrock et al. teach a method of forming a capacitor construction, comprising:

- forming a capacitor electrode 32 comprising conductively-doped silicon (n-doped),  
and
- providing a metal-containing material 30 between the capacitor electrode 32 and a capacitor dielectric layer 28 (i.e. a high dielectric constant material) (Fig.2).

Uhlenbrock et al. is silent as to the thickness of the metal-containing material being less than about 20 Å (claims 46 and 49) or equal to about 20 Å (claim 46) or less than or equal to about 15 Å (claims 47 and 56) or less than or equal to about 10 Å (claims 48 and 57) or less than or equal to about 70 ALD cycles (claim 40).

However, the selection of the thickness of the metal-containing material, which acts as a barrier layer, is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). For example, the metal-containing material layer can be optimized to a sufficient thickness to prevent a reaction between the capacitor dielectric layer and the conductively-doped silicon, as evidenced by Chun et al.. Chun et al., in an analogous art, teach forming a metal-containing layer 41 (i.e. the barrier metal layer) between capacitor dielectric layer 43 and the conductively-doped silicon 37, wherein the barrier metal layer is formed with a thickness enough to prevent reaction between the polysilicon layer and the high dielectric film (col. 2, lines 41-47).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time of the invention was made, to optimize the thickness of the metal-containing material, as taught by Chun et al., in forming the metal-containing layer in Uhlenbrock et al., since choosing a desired thickness for the metal-containing layer to prevent undesirable reaction between adjacent layers is within the level in the art, as suggested by Chun et al. (col. 2, lines 41-47).

In re claims 42 and 51, Uhlenbrock et al. also teach that the dielectric layer 28 comprises tantalum, (i.e. Ta<sub>2</sub>O<sub>5</sub>, col. 6, lines 7-9).

4. Claims 43, 52, 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uhlenbrock et al. in view of Chun et al. as applied to claims 40-42 and 49 above, and further in view of Chau et al. (US 6,617,210).

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In re claims 43 and 54, Uhlenbrock et al. in view of Chun et al. do not teach that the metal-containing material comprises one or more of titanium nitride, tantalum nitride, hafnium nitride and tungsten nitride.

Chau et al., however, in an analogous art, teach forming a thin metal-containing layer 102 (i.e. TiN or TaN) between a high dielectric constant layer 101 and a doped polysilicon layer 103 (col. 2, line 66 through col. 3, line 6).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time of the invention was made, to use TiN or TaN, as taught by Chau et al., as the metal-containing layer in Uhlenbrock et al. in view of Chun et al. , since TiN and TaN are good barrier materials for preventing reaction between high dielectric constant material and the doped polysilicon.

In re claim 52, Chau et al. remedy the deficiency in Uhlenbrock et al. in view of Chun et al. because Chau et al. teach that the high dielectric layer can be aluminum oxide (col. 2, lines 10-16).

#### ***Allowable Subject Matter***

5. Claims 31-39 are allowed.
6. Claims 44, 45, 53 and 55 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record neither teaches nor suggest that the metal-containing material comprises titanium silicide, tantalum silicide (claims 44 and 55) or predominately comprises one or more of titanium, tantalum, hafnium and tungsten (claims 45 and 53); and forming a thick

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metal-containing material over the PMOS gate not over the NMOS gate and forming a thin metal-containing material over the PMOS and NMOS gate regions (claim 31).

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 571-272-1863. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hsien-Ming Lee  
Primary Examiner  
Art Unit 2823

June 25, 2004

*Hsien Ming Lee*  
6/25/2004